Extended Summaries of IUPAC Technical Reports

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Chirality in synthetic agrochemicals: bioactivity and safety considerations

(Kurihara N, Miyamoto J, Paulson GD, Zeeh B, Skidmore MW, Hollingworth RM and Kuiper HA, *Pure Appl Chem* **69**:2007–2025 (1997)).
IUPAC Technical Report on Pesticides 37 International Union of Pure and Applied Chemistry, Chemistry and the Environment Division, Commission on Agrochemicals and the Environment

SUMMARY

Most synthetic agrochemicals with chiral structures are marketed as racemates, even though the desired biological activity may be derived from only one isomer. However, some synthetic agrochemicals such as pyrethroid insecticides, aryloxypropanoate herbicides and triazole fungicides are marketed as the most biologically active isomer. Numerous reports describing the relative biological activities, preparations and analyses of enantiopure agrochemicals are available. Some examples of how different enantiomers in racemates are selectively metabolized have also been reported. When agrochemicals have chiral structures, efforts should be made to define the mode of action, elucidate metabolic pathways and to define the human and environmental toxicity of each isomer. If there are large differences in the biological activities of individual enantiomers in racemates, it is desirable to develop and use only the isomer with the highest sought-after biological activity.

RECOMMENDATIONS

(1) Studies are needed to better define the mechanisms of toxicity and metabolism of individual isomers of chiral and pro-chiral agrochemicals in target and non-target organisms.
(2) Where one or more isomers in a mixture pose significant environmental or human health risks, then that isomer should be removed even where it contributes to the desired biological activity.
(3) Where an isomer does not have the desired biological activity, it is preferable to remove that isomer, if economically feasible, even if it does not pose a significant risk. The use of only the stereoisomer with the desired biological activity will reduce the total amount of chemicals introduced into the environment, and therefore it merits careful consideration.
(4) Better methods for production of enantiopure isomers (biotechnology, asymmetric synthesis and/or separation) are needed.

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Pesticide fate in tropical soils

(Racke KD, Skidmore M, Hamilton DJ, Unsworth JB, Miyamoto J and Cohen SZ, *Pure Appl Chem* **69**:1349–1371 (1997))
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SUMMARY

Pesticide use is an important component of agricultural and non-agricultural pest control in tropical areas. However, the fate of pesticides in tropical soils is not as well understood as in soils from temperate regions. Tropical soils defy easy generalizations, but they are typically very old soils characterized by year-round uniformity of temperature regime. Although only a few studies have directly compared pesticide fate in tropical and temperate soils, there is no evidence that pesticides degrade more slowly under tropical conditions. Laboratory studies in which soils have been held under standardized conditions reveal that pesticide degradation rates and pathways are comparable between tropical and temperate soils. However, field investigations of fate of pesticides in tropical soils indicate that dissipation occurs more rapidly, in some cases much more so, than for pesticides used under similar temperate conditions. The most prominent mechanisms for this acceleration in pesticide dissipation appear to be related to the effect of tropical climates, and would include increased volatility and enhanced chemical and microbial degradation rates on an annualized basis.

RECOMMENDATIONS

(1) *Continued investigations in tropical soils and environments*. Investigations on the fate and effects of pesticides in tropical soils, especially under tropical environmental conditions, should continue to be encouraged. Pesticide regulatory

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